

## WHAT IS CLAIMED IS:

1. A method comprising the steps:

associating at least one polynucleotide molecule to a non-human sperm cell

through at least one non-liposome based linker;

- 5 effecting *in vitro* or *in vivo* fertilization of a non-human egg cell with the non-

human sperm cell associated through the non-liposome based linker with the at

least one polynucleotide molecule.

2. The method of claim 1 wherein the associating occurred *in vitro* or *in vivo*.

3. The method of claim 1 wherein the non-liposome based linker further comprises a

10 polypeptide.

4. The method of claim 3 wherein the polypeptide is a protein.

5. The method of claim 3 wherein the non-liposome based linker is associated to an external surface of the non-human sperm cell.

6. The method of claim 1 wherein the non-liposome based linker is a sperm-specific linker.

- 15 7. The method of claim 1 wherein the non-liposome based linker is an immunoglobulin.

8. The method of claim 1 wherein the non-liposome based linker is an antibody.

9. The method of claim 1 wherein the at least one polynucleotide molecule is a DNA molecule.

10. The method of claim 9 wherein the DNA molecule comprises a nucleic acid sequence  
20 encoding for a growth hormone

11. The method of claim 9 wherein the DNA molecule comprises a nucleic acid sequence encoding for a gene product that confers pathogen or disease resistance.

12. The method of claim 11 wherein the gene product is human interferon  $\beta$ .

13. The method of claim 9 wherein the DNA molecule comprises a nucleic acid sequence encoding for a gene product that confers immune tolerance in a human body.

14. The method of claim 9 wherein the DNA molecule comprises a nucleic acid sequence encoding for a gene product that is specifically produced in a non-human animal's milk.

5 15. The method of claim 1 wherein the non-liposome based linker interacts with the at least one polynucleotide molecule via molecular interaction from the group consisting of ionic interaction, covalent interaction, Vander Waals interaction, and ligand-receptor interaction

16. The method of claim 8 wherein the antibody is characterized by having binding affinity to a sperm cell and wherein the sperm cell bound with the antibody retains the ability to fertilize  
10 an oocyte.

17. The method of claim 8 wherein the antibody is characterized by ability to bind to sperm cells from a plurality of species of animals.

18. The method of claim 8 wherein the antibody exhibits binding properties to a polynucleotide such that upon fertilization, the polynucleotide is introduced into a zygote.

15 19. The method of claim 1 wherein the non-human sperm cell is selected from the group consisting of: mouse sperm cell, cow sperm cell, pig sperm cell, chicken sperm cell, sheep sperm cell, and goat sperm cell.

20. An article of manufacture comprising:

a container comprising a non-liposome based linker; and

20 an instruction to use the non-liposome based linker for attaching a polynucleotide molecule to a sperm cell.

21. The article of manufacture of claim 20 wherein the non-liposome based linker is an antibody.

22. The article of manufacture of claim 21 wherein the antibody is characterized by having binding affinity to a sperm cell and wherein the sperm cell bound with the antibody retains the ability to fertilize an oocyte.

23. The article of manufacture of claim 21 wherein the antibody is characterized by the ability to bind to sperm cells from a plurality of species of animals.

24. The article of manufacture of claim 21 wherein the antibody exhibits binding properties to a polynucleotide such that upon fertilization, the polynucleotide is introduced into a zygote.

25. The article of manufacture of claim 20 further comprising a second container that comprises the sperm cell.

26. The article of manufacture of claim 20 wherein the sperm cell is selected from the group consisting of mouse sperm cell, cow sperm cell, pig sperm cell, chicken sperm cell, sheep sperm cell, and goat sperm cell.

27. The article of manufacture of claim 20 further comprising a second container that comprises the polynucleotide molecule.

28. The article of manufacture of claim 20 wherein the instruction provide directions to perform the following steps:

associating at least one polynucleotide molecule to a non-human sperm cell

through at least one non-liposome based linker;

effecting *in vitro* or *in vivo* fertilization of a non-human egg cell with the non-

human sperm cell associated through the non-liposome based linker with the at

least one polynucleotide molecule.

29. The article of manufacture of claim 20 further comprising a sperm cell, wherein the non-liposome based linker and the sperm cell are contained in the same container.

30. The article of manufacture of claim 29 wherein the container is adapted to receive a solution comprising a polynucleotide molecule.

31. The article of manufacture of claim 20 wherein the article of manufacture is a kit.

32. An article of manufacture comprising:

5                   a container comprising an antibody, wherein the antibody is characterized by having binding affinity to a sperm cell and wherein the sperm cell bound with the antibody retains the ability to fertilize an oocyte.

33. The article of manufacture of claim 32 wherein the antibody is characterized by the ability to bind to sperm cells from a plurality of species of animals.

10 34. The article of manufacture of claim 32 wherein the antibody exhibits binding properties to a polynucleotide such that upon fertilization, the polynucleotide is introduced into a zygote.

35. The article of manufacture of claim 32 wherein the container further comprises a sperm cell, and wherein the antibody is bound to the sperm cell.

15 36. The article of manufacture of claim 32 wherein the container is adapted to receive a solution comprising a polynucleotide molecule.

37. The article of manufacture of claim 32 wherein the container is a plate having a plurality of wells.

38. The article of manufacture of claim 32 wherein the article of manufacture is a kit and further comprises a second container comprising non-human egg cell.

20 39. A chicken comprising a nucleic acid molecule, wherein the nucleic acid molecule comprises a nucleic acid sequence encoding human interferon.

40. The chicken of claim 39 wherein the human interferon is human interferon  $\beta$ .

41. The chicken of claim 39 wherein the nucleic acid molecule further comprises a  $\beta$ -actin promoter.

42. The chicken of claim 39 wherein the human interferon is present in serum of the chicken.

43. The chicken of claim 42 wherein the human interferon in the serum of the chicken is  
5 detectable by ELISA.

44. The chicken of claim 39 further comprising human interferon  $\beta$  proteins detectable by ELISA in a serum sample of the chicken.

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